REMARKS

Claims 7-13 are pending in the present application.

In the Office Action, at the outset, the Examiner notes that foreign document KR-10-0197113 has not been considered because it was not accompanied by a concise explanation of its relevance. This is not correct. The Korean document was accompanied by an English translation of an Office Action issued by the Korean Patent Office in connection with the prosecution of applicant's corresponding Korean patent application. The Office Action explains the relevance of the Korean document. Accordingly, the submission complies with 37 C.F.R. 1.98(a)(3), and the Examiner is therefore respectfully requested to consider the document and make it of record.

Claim 7 has been rejected under 35 U.S.C. 103(a) as obvious over Yoshiki et al. (USP 5,843,236) in view of Kou et al. (USP 6,246,175) and Dandl (USP 5,707,452). In response to this rejection, independent claim 7 has been amended to clarify the configuration of the microwave cavity resonator of the present invention. Support for the amendment to claim 7 can be found at page 10, lines 5-9 and page 13, lines 8-24 of the specification.

The distinctions between the present invention and the cited references are as follows:

First, each of the first resonance units (resonance units 32) and the second resonance units (resonance units 33) which are included in the microwave cavity resonator of the present invention does not have function of a resonator alone. In the present invention, as described in the specification on page 13, lines 8-24, and Figs 2A and 2B, the microwave cavity resonator is constructed by locating the terminal end portion 31 having no opening which is formed by metal plate or the like and the end portion having opening 38 of the cavity resonator which is formed by a metal plate slit or the like, and alternately disposing a plurality of resonance units 32 and 33 between the terminal end portion 31 and the end portion having opening 38 of the cavity resonator. That is, in the present invention, each of the resonance units 32 and 33 does not have the function of the resonator, and the microwave cavity resonator is constructed by the terminal end portion 31 and the end portion having opening 38 of the cavity resonator.

The above-described configuration of the present invention, recited in independent claim 7, is not disclosed in USP 5,843,236, USP 6,246,175, and USP 5,707,452. Further, even if these three references are combined, as in the rejection of claim 7, the combination does not result in the configuration of the present invention.

The distinctions between the present invention and the references are explained as follows:

1) USP 5,707,452 (Dandl)

USP 5,707, 452 discloses an antenna array 60 comprising a coaxial line 66 where a slot 63 with a radiating stub 62 being formed therein. This reference teaches that the slot 63 without the stub 62 radiates only a small fraction of the power coupled into the coaxial line 66, and to that end the radiating stub 62 is provided to increase the radiated power (See col. 9, line 50 to col. 10, line 11 of USP 5,707,452) .

The Examiner asserts that the configuration of the radiating stubs 62 (cavity resonator) being separated by one half wavelength λ/2 in microwave introducing section for formation of ECR plasma, meets the claimed limitation of the first resonance units disposed at a distance of λg (λg: guide wavelength) recited in claim 7 of the present application.

The means for introducing microwave power in USP5,707,452 comprises, the individual slot 63 being provided at left side and right side of the stubs for the respective side of the pairs of the two symmetrically-shaped radiating stubs 62 separated by half-wavelength λ/2, as shown in Figs 3. Namely, the slot 63 is formed at half-wavelength λ/2 intervals. Accordingly, the microwave introduced from the adjacent slot 63 is the microwave with 180 degrees (°) out of phase, which teaches away from the in-phase microwave of the present invention recited in claim 7.

The present invention recited in claim 7 is different from USP 5,707,452, and since in the straight shape microwave cavity resonator, first resonance units having a length λg/2 (λg: guide wavelength), but not having opening in a side, and second resonance units having a length of λg/2 and having at least one second opening in a side, are alternately arranged sequentially from the

terminal end portion, two or more second resonance units being disposed in the straight shape microwave cavity resonator, the standing waves, which are formed in the second resonance units, can be arranged in their phases. Consequently, the configuration recited in claim 7 can lead to in-phase microwave as mentioned above.

USP 5,707,452 also discloses that coherent plane waves can be obtained as a resonant antenna by adjusting the size, spacing and the termination of the radiating stub 62. (See col. 10, lines 6-11 of USP 5,707,452). However, USP 5,707,452 does not disclose the method for realizing the above, and cannot lead to the present invention recited in claim 7.

The radiating stub 62, i.e., a cavity resonator, is formed outside the waveguide 66 and thus not operable to bring the microwave in a waveguide into resonance. Therefore, USP 5, 707,452 cannot exert the effect of the resonator units (e.g., suppression of the effects towards the power side of load variation) of the present invention as recited in claim 7.

In summary, for the reasons mentioned above, the configuration of the resonance unit disclosed in USP 5, 707,452 is completely different from those disclosed in claim 7 of the present invention.

2) USP 5,843,236 (Yoshiki et al.) and USP 6,246,175 (Kou et al.)

The distinctions between the present invention and USP 5,843,236 and USP 6,246,175 will now be explained.

USP 5,843,236 does not disclose or suggest a structure corresponding to a resonance unit in the waveguide of the microwave introducing section.

USP 6,246,175 discloses an adjustable surface wave resonant cavity 100 to bring into resonance with surface wave excited adjacent to the surface of dielectric plate 64. However, it is disclosed at col. 6, line 45 of USP 6,246,175, that the microwave excites the resonant mode of the π mode. Therefore, the adjacent cavity is deemed to resonate with the microwave in the opposite

phase. Also, propagation of microwave energy is not limited between the adjustable surface wave resonant cavity 100 and a surface wave plasma. Thus, the structure of USP 6,246,175 is incapable of using only the in-phase microwave for generating plasma as recited in claim 7 of the present invention.

Further, the resonator disclosed in USP 6,246,175 acts to increase amplitude of the surface wave by bringing into resonance with the surface wave generated from the dielectric plate 64 disposed parallel to the adjustable surface wave resonant cavity 100. Therefore, a configuration for limiting the propagation of microwaves, such as an opening, is not located between the adjustable surface wave resonant cavity 100 and the dielectric plate 64, because such limitation would obstruct the purpose that the amplitude of the surface wave is increased by the resonance. In addition, the resonator of USP 6,246,175 is of a configuration to resonate with the microwave in the opposite phase.

In contrast, in the present invention, the openings 24 (corresponding to the second opening recited in claim 7) are arranged in the region of the microwave cavity resonator for introducing the microwave into the plasma generating chamber. These openings 34 are not arranged in order to bring into resonance with surface wave in the plasma generating chamber. The purpose for arranging openings 34 is that impedance of the resonance unit is adjusted to reduce unnecessary reflected wave excited in the microwave cavity resonator and to stably form standing waves. As a result, in-phase microwaves can be introduced stably into the plasma generating chamber.

Claims 8-12 have been rejected over the references applied to claim 7, discussed above, and further in view of Hiroshi et al. (USP 5,389,154). In response, applicant respectfully submits that claims 8-12 are patentable over the cited references for the same reasons as discussed above that independent claim 7, from which they depend, is patentable.

For the foregoing reasons, applicant respectfully submits that claims 7-12 are distinguishable over the cited prior art, and that the application is in condition for allowance.

A prompt passage to issuance is earnestly solicited.

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Respectfully submitted,

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